SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE TIN TRADE, AND ITS PROSPECTS.

Sir,—In last week's Journal some observations are offered on the subject of "The Tin Trade, and its Prospects," in which it is said that "the spring sale in Holland will not exceed 120,000 slabs." Will you allow me to inform your correspondent that it is highly improbable —or, rather, let me say that it is impossible—that this sale will reach such a high figure. On Dec. 30 the unsold stock in Holland amounted to 62,848 slabs, and the quantity afloat to 47,000 slabs. Taking for granted that all this tin should arrive in time for the sale, it would even then not reach the quantity named. But as the greater part of the tin afloat was only shipped at the latest dates, and as it is well known that it takes always a long time for the vessels to complete their cargoes in Java, the greater part of the expected quantity will consequently not have arrived before the commencement of the next spring sale, and will thus not be included in it, unless the Trading Company makes a special reserve to sell more tin than is actually held at the date of fixing the sale, which is highly improbable. I can still add that the general impression prevailing here is that the next spring sale will not amount to more than 80,000 to 85,000 slabs.

Rotterdam, Jan. 10. L. Th. van Houten.

ON THE IRON MANUFACTURE OF SOUTH STAFFORDSHIRE.

Sir,—There is evidence that the Romans made iron in the Forest of Dean, and it is believed in South Staffordshire also. Sussex was the first location of this manufacture by the English, wood for charcoal and iron ore being abundant there. Afterwards South Staffordshire and Yorkshire became producers of iron smelted with charcoal. The celebrated Dud Dudley was the first who substituted coal for wood charcoal for smelting iron. In the year 1619, when 20 years of age, he undertook the management of his father's works at Pensanett, near Dudley; these consisted of one blast-furnace and forges, where coal was first used, and afterwards at Cradley he used coal. Dudley seems to have met with some resistance from his neighbours; the elements also were unfavourable, for a great flood swept away his works at Cradley. These were replaced; a furnace was established at Himley, and another at Sedgley, where it is stated 2 tons of iron were turned out per week. About the year 1750 Abraham Darby introduced the process of coking coal for smelting purposes; this he successfully applied at Coalbrookdale. In the year 1760 blowing-cylinders were first introduced at Carron Iron Works, in lieu of bellows, consequent on the invention and improvement of the steam-engine. Previous to this time iron appears to have been imported largely from Sweden and Spain. In 1788 South Staffordshire had nine furnces using coked coal, producing each about 15 tons per week, but no charcoal furnaces. In other parts of England there were 24 charcoal furnaces, and 44 using coked coal. In 1796 there were 14 furnaces in operation in South Staffordshire:—

Level	Furnaces 1	Bradley	Furnaces 3
Brierley Hill	1	Graveyard, Dudley	1
Duffield	2	Dudley Port	1
Bilston	2	Tipton	2
Gospel Oak	1		

In the same year (1796) furnaces were in operation in North Staffordshire, Shropshire, Cumberland, Yorkshire, Derbyshire, Gloucester, Hereford, and South Wales. The discoveries of Cort for puddling iron date from the year 1784; and to this may be attributed the development of the iron trade up to the year 1800, when 16 other furnaces had been erected in addition to those named above. In the year 1806 there were 222 furnaces in Great Britain, of which 162 were in blast. In South Staffordshire, in this year, there were 42 blast-furnaces, producing each about 1600 tons of iron yearly, or 30 tons per week. The invention of hot-blast in 1829, by Neilson, of Glasgow, produced a rapid development of the Scotch iron trade, inasmuch as the blackband ironstones, which were too refractory to be reduced by means of cold-blast, were successfully smelted by hot-blast. In 1829 South Staffordshire had 123 blast-furnaces, and 39 of these had been built since 1823. South Staffordshire was then the principal iron-producing centre of the kingdom, making one-third of the total production of pig-iron, and converting the most of this into finished iron. Since 1829 the number of furnaces has increased to 188, but only 172 may be considered at the present time as available for smelting in future, and 97 at present in blast.

The ironstones used in South Staffordshire for smelting are—

1.—The native clay ironstone of South Staffordshire.
2.—The brown hematite of North Staffordshire.
3.—The red hematite of Lancashire and Cumberland.
4.—The clay ironstone of the Potteries, North Stafford.
5.—The Northampton brown ore.

The native ironstones differ much in composition and quality; they yield from 25 to 40 per cent., and upwards; they are still in great demand for making all mine pig-iron, in contradistinction to that smelted from foreign ores and cinder. The prices realised for the former indicate its superiority over the others. Analysis of Gubbin and Balls ironstone, Darlaston, as given in the Geological Survey:—

Protoxide of iron ..... Per cent.	49·30
Peroxide of iron	3·61
Protoxide of manganese	·86
Alumina	·34
Lime	·69
Magnesia	·45
Silica	·23
Potash	·09
Carbonic acid	32·65
Phosphoric acid	·23
Bisulphide of iron	·13
Sulphide of lime	1·27
Water	·66
Organic matter	·54
Ignited insoluble residue	9·42 = 99·87

The gubbin ironstone (Dudley) gives protoxide of iron .. Per cent. 46·36
The blue flats ironstone (Darlaston) gives protoxide of iron ..... 42·34

These may be taken as average samples of each measure, though they will vary in composition in different districts.

The Froghall, or brown hematite, produces iron of good quality—about 36 per cent. It contains lime in quantity almost sufficient to flux without the addition of limestone. The red hematite yields 60 to 65 per cent. of good quality.

The clay ironstone of North Staffordshire yields a good quality of pig-iron—40 per cent., und under. Red pottery mine is used for fettling. The Northampton ore yields iron of medium quality—from 25 to 30 per cent. Besides these, cinder is used for mixing with the ores. The tap and flue cinder mixed together make iron suitable for foundry purposes, but not so well adapted for the manufacture of malleable iron. B. Gibbons, of Corbyn's Hall new furnaces, was the first to utilise forge-cinder in the blast-furnaces.

Having given a preliminary historical sketch of iron-making in this district, it may be observed that from the close competition which has arisen in the trade South Staffordshire was thought to be beaten in the race; while other districts have been making rapid advances and improvements, it has apparently stood still. We see, however, signs of winning its former prosperity, and adapting itself to the competition of the times and the loss of its most valuable minerals, and so far making an endeavour to set matters right again. It is thought by some that the manufacture of rails will be more extensively entered into, that by admixture of native and foreign ores, and the careful use of the fuel still remaining, a profitable trade may be carried on. When we consider the large demand which must arise for rails in renewing our English railways, and for supplying which Staffordshire is centrally situated, and the immense demand which is likely to arise for rails in Russia, Hungary, Spain, America, and other parts, there will, doubtless, some part of this supply be produced in the existing Staffordshire forges and mills, and thus uphold the vitality of the staple trade of the district.

The Willenhall Blast-Furnaces.—These works, established 1855 by Messrs. Fletcher, Solly, and Urwick, have been the first in the district whereat modern improvements have been introduced, with a view to economy in the use of fuel, and reducing the cost of producing pig-iron generally. The furnace gases were first utilised here in 1860 for heating the blast-engine boilers; in the following year they were further utilised in heating the blast. This was effected under the superintendence of Mr. R. Griffiths, the present manager. The company have lately adopted Lurmann's closed hearth at one of their furnaces, which has given very satisfactory results during the six months it has been in use, and is intended to be applied to other furnaces. There are three blast-furnaces at Willenhall, 45 ft. high, 13 ft. at the boshes; these are round, on metal pillars, and cased with wrought-iron. No. 3 furnace is worked with Lurmann's closed hearth, the hearth is 6½ ft. in diameter, and has six tuyeres placed equi-distant around the furnace. The advantage of the closed hearth is the concentration of heat in the hearth, the fore-hearth is done away with, and no bar-work is required. The tuyeres are placed 8 in. above the cinder level, which is much safer than when the tuyeres are placed so as to blow into the cinder, as is done in the old system. The arrangement of fore-hearth, dam, and tuyeres in which may be considered as a remnant of the cold-blast period of blast-furnace. The tuyeres are all of gun-metal.

As there is no interruption to the working of the furnace on Lurmann's principle, excepting about 10 minutes at each cast, there is little loss of heat, and some time saved as compared with the old plan. This furnace produces 210 tons of pig-iron weekly, an increase of 50 tons on what was made with the open hearth. The gases are withdrawn at the top of No. 3 furnace, on Addenbrooke and Millward's principle. There are thirteen openings from the interior, 2 ft. by 1 ft., 5½ ft. from the top, into the gas chamber. The chamber is 5 ft. high, 4 ft. wide, sloping backwards, to admit of being cleaned with facility from the outside. No. 2 furnace is now being remodelled; it is being arranged on the same principle for taking off gas at the top, and with closed hearth, and six tuyeres for the blast. No. 1 furnace is in operation, with the Darby Bell method of taking off the gas, and the old plan of hearth. The make of pig-iron is about 150 tons weekly. There are five tuyeres to this furnace. The blast-engine is 52 in. steam cylinder, 104 in. blowing cylinder, with the beam between, 10 ft. stroke of pistons. It goes at the rate of 10½ strokes per minute, but can go 13 strokes, and supply blast to three furnaces. The pressure of steam is 10 lbs., and is condensed. There are six boilers, plain cylindrical, enclosed in a shed. The cold-blast pipe to the stoves is 6 ft. in diameter. The gas main to the stoves and boilers is 6 ft. in diameter, lined with 2½ in. thickness of fire-brick. There are six stoves for heating the blast, containing some 24 and some 36 pipes each. These pipes are of the 5 in. twin pattern, arranged in a circular and oval form. A new stove has lately been added to these, for attaining higher temperature of blast, an increase of heating surface, and durability. There are two rows of pipes in this stove; each row consists of eight double pipes, 12 ft. long, 12 in. diameter; they are placed so that the blast traverses through the whole of those in one row continuously, equal to 192 lineal feet of heating surface. Other stoves are intended to be constructed on this model, but with three rows of pipes to each stove; one stove will then be appropriated to each furnace. The temperature of blast at present is about 1100° at the tuyeres. The pipes conveying the blast between the stoves and furnaces are covered with a non-conducting composition, by which a much higher temperature of air has been obtained on its entering the furnace.

There are two kilns built for calcining the Staffordshire ironstone; they are 42 and 45 ft. high. The ironstone is raised to the top of these up an incline. On the opposite side a 24-horse beam-engine is placed for this purpose. The materials are raised to the top of the furnaces up an incline by an engine placed behind the furnaces; this is an 18-horse horizontal engine, on second motion, using a three-linked chain, and one carriage.

Use two-thirds coal and one-third coke in mixture with the ironstone and lime for smelting; the new mine coal is used; the bottom coal is coked. There are five pits in operation for raising coal; about 25 tons each per day, besides others raising ironstone; the Robin, Gubbin and Balls, and blue flats are extracted. Two locomotives, on a narrow-gauge convey materials between the pits and the iron works. This company's works are situated close to the Birmingham and Walsall Canal, giving faciiity for exporting iron and obtaining iron ore from other districts, with limestone and coke for smelting purposes.—*Jan.* 11. A Mining Engineer.

PRACTICAL COLLIERY WORKING.

Sir,—I have pleasure in replying to the letter signed "C. V.," in last week's Journal,—that the condition of workings mentioned were quite exceptional, and that all the other "bords" in question had been stopped until the gas should have been removed, for which object the place in which the explosion occurred, as stated, was being pushed forward by the aid of brattice, &c., and at the time of the explosion had 3 or 4 yards further to go before an air connection could be had, which has since cleared all the working places in that district. The gas accumulated in that "bord" during the week in consequence of leakage in brattice, caused by the falling of stone from roof, &c. Had the hewer waited an hour or so, as ordered by the deputy to do, after the brattice had been set to rights, before commencing his work, there would have been no danger in his working there—of course, not blasting.

I think these few answers are due to "C. V.," whose remarks without knowing the full particulars are quite justifiable. I think he will now agree with me that the manager had taken all requisite precaution, and has in no way defied any Act of Parliament.

Jan. 10. Nitram.

PREVENTION OF COLLIERY ACCIDENTS.

Sir,—The accident at Dowlais has led to the oft-asked questions being once more repeated—Are any of the safety-cages which have been from time to time invented really suitable and efficient, and, if so, why are they not adopted? The enquiry is this time made by one who is supposed to occupy a high position in the scientific world, and he urges, in continuation, that if the answer to the first of these questions be positive—he probably means affirmative—then that "their adoption ought to be made compulsory by the Legislature, and, in the event of enactments to that effect, colliery proprietors should thereafter be liable to indictment for manslaughter if fatal accidents should occur to their pitmen from the breakage of winding-ropes." It is difficult to determine which is the more to be admired—the practical character of the suggestion or the justice it would ensure to all concerned. As the statement is open to more than one reading, it is more difficult to deal with than it otherwise would be; but it certainly appears scarcely just that, because the adoption of a safety-cage is made compulsory by the Legislature, therefore the colliery proprietor shall be guilty of manslaughter if a man be killed by the breaking of a winding-rope.

Now, the fact is a really suitable and efficient safety-cage has still to be discovered, all that have yet been brought forward being objectionable for one reason or another. There are, doubtless, some very quaint and interesting specimens of safety-cages at the School of Mines, but a museum of that kind is not the place where inventions of practical utility should be looked for. That many of the contrivances are highly ingenious cannot be questioned, but in practice they have, without exception, been found wanting—either they are too fragile, damage the guides, or require such continual attention to keep them in order that it is dangerous to place reliance upon them; and it is generally felt that if reliance be placed upon an apparatus of the failure of which there is a remote probability, it is better to depend upon the rope alone. The various safety-cages which have been proposed are readily referable to two classes, and the great question is, Which class is the best? One class of catch—for really the safety-cage is merely a safety-catch applied to an ordinary cage—is so arranged that it is brought into play at the end of each journey up and down the pit, the object being to prevent the apparatus becoming worthless from disuse. The idea is doubtless good, but the objection is that the wear and tear is so great that the apparatus is worn out and useless before it is required to avert calamity, the consequence being that when the accident happens it is fatal, as usual. In the other class the apparatus is never brought into play until the accident occurs, the object being to avoid the dangers inseparable from the former; the wear and tear is, of course, prevented, but frequently when the accident happens it is found that the whole concern has become fixed from disuse.

Perhaps the only arrangements not open to these objections are those somewhat like Aytoun's and Nyst's, each of which depends for its safety upon the mere change of position of a metal fork, or its equivalent, so as to become fixed against the guide-rods. Both of these catches are extremely simple, have no springs, or similar contrivances, to get out of order, and would not cost more than a few shillings to apply them. It has been said that they knock the guide-rods to pieces when they are brought into action, but as the damage can only occur when an accident has happened, and a calamity been averted, surely this should not prevent their adoption. As neither are protected by patent every colliery proprietor can have them made by his own smith. It is a very common opinion amongst practical men that the use of safety apparatus begets carelessness on the part of those engaged about the shaft, but, perhaps, the ground for this complaint is more apparent than real, and as the cage is without question as safe with the apparatus as without it, it might be desirable to accept reliance on the catch as more than equal to the diminished attention of the men.—*Jan.* 13. Miner.

BOILER EXPLOSIONS.

Sir,—In reference to my letter which appeared in the Journal of the 11th inst.,* but more especially to my private communication of Nov. 28., in which I stated that the catastrophe on board the Thistle was referable to priming as the cause of "deficiency of water," I now propose to enquire what is the cause of "priming," and to apply the principle elicited to the portions of the evidence given at the coroner's inquest that have more directly reference to it; and as I need scarcely state that that principle is electricity, as illustrative of the apparently fickle nature of that agent I may direct attention to the very old fact, that if air be expelled from the lungs with the mouth open it has a warming influence on the hands, but quite a contrary effect if there be only a small aperture in the lips, the difference of temperature being, I conceive, referable to compression—the cause of the intense cold produced by the air compressing machine already referred to.

It has long been known that if water be dropped on hot iron it does not diffuse or spread over the metal, nor evaporate, but retains the perfectly globular form, as dew does on the leaves of plants, which are evidently in an immediately opposite condition to the hot iron, and plants we know are highly electrical. *All incandescent bodies are surrounded by an atmosphere electrical in proportion to the incandescence;* the spherical condition of the drop of water on the iron or leaf may, then, rationally be assigned to the atmosphere by which it is surrounded, and I need scarcely observe that the atmosphere of a furnace must be electrical in the extreme, and high pressure steam, which is highly electrical, always primes.

Mr. John Edgar, engineer student, the only person who escaped from the engine-room, stated "When about to commence the third run I saw a sudden *flash of light* or *flame* issue from out of the stoke-hole towards the engine-room, which I thought at first to be merely a back draught. I then saw, or thought I saw, some soot or ashes

* On the proposed ventilation of coal mines by means of an air-compressing machine.

falling over the engines, and I stooped so as to avoid it. I then found myself surrounded by steam." It is not stated what time elapsed between the flash of light and the issue of the soot, ashes, or steam, and, what may appear altogether unaccountable, no steps were taken at the adjourned inquest to throw light on such a truly important point.

To give the whole of Mr. Walter Wilson Williamson's evidence, and that of the other scientific gentlemen, would be both a waste of time and the space of your Journal, much of it having no reference to the question at issue. We are told, then, by Mr. Williamson that the engines are of 120-horse power, and are so fitted as to be used as condensers or non-condensers. That on arriving at the Maplin sands, the vessel ran six runs on the measured mile. That the terms condensing and non-condensing mean low and high pressure. That after the six runs with the low-pressure engines eight circles were made, but of what length each is not stated. That the next thing done was stopping, and starting the engines for time. Then she steamed some distance to get a clear berth, and the air-pumps were disconnected, and the condensers shut off, to work the engines under high pressure; and that the *low* pressure was 50 lbs. and the high 70 lbs. to the square inch. That after the condensers were taken off the ship was again taken on the mile, and two runs were obtained under a pressure of 70 lbs., everything appearing to work satisfactorily, and that on turning to come on the third mile the accident happened, a sort of a puff being heard. This, then, is the substance of the evidence given at the first enquiry, and the inquest was adjourned, "on the understanding that all *particulars should be obtained* by scientific men."

On the adjourned inquest, Mr. Williamson further deposed that, in his opinion, deficiency of water was the cause of the rupture in the boiler, but whether that deficiency was caused by the feed-cock not being sufficiently open, or whether it arose from excessive priming, he was unable to say; and that priming is caused by a mixing of the water and steam, and its then rising to the top of the boiler. That the other two boilers, which were not at all injured, had only the same opening of the feed-cock, and they were sufficiently supplied with water. That the priming in boilers is generally indicated by the rising and falling and general disturbance of the gauge water-glass, which is seen from the stoke-hole. If this occurred the engineer ought to further open the feed-cock, and put more water into the boiler, *and close the dampers, in order to reduce the draught of air to the fires*, so as to reduce the steam. That the rupture occurred in the centre boiler, which *being opposite the opening to the engine-room would have a greater draught*, and the steam would probably be generated more quickly than in the others.

Mr. John Boffey, foreman of boiler makers, attributed the cause of the fracture to the top of the furnace becoming red-hot for want of water, and thus the strength of the boiler became completely destroyed, in which opinion Mr. John Kingmarsh, leading man of fitters, quite agreed, and echoed Mr. Williamson's opinion as to the great draught. Mr. Thomas Beardsall, a fitter, said there is no accounting for priming; *the pressure of* steam has little or nothing to do with it. *Bad stoking* will produce it as much as anything. There is a *greater tendency to prime* with *high* pressure than with *low*. That he believed shortness of water was the cause of the rupture, and he could only suppose that the shortness of water resulted from neglect.

Mr. Thomas Aveling, engineer of Rochester, stated that when the engines are working on low pressure the exhausted steam is condensed, and returned to the boiler, but when working at high pressure the exhausted steam is turned into the chimney, *whereby the draught is very much increased;* and, consequently, there ensues a greater generation of steam. Mr. Andrew Murray, C.B., Surveyor of Factories, and Consulting Engineer to the Admiralty, said it would take quite a quarter of an hour to reduce the water in the boiler from the proper level till the furnace taps were bare, as he was satisfied was the case here; and Mr. Lavington Fletcher, C.E., chief engineer to the Manchester Steam Users' Association for the Prevention of Steam-Boiler Explosions, stated that as to the cause of the overheating of the furnace crowns he had come to the conclusion that the water supply had been overlooked, and thus allowed to run short. He should, however, perhaps add that he had met with numerous cases in which furnace crowns have been injured, though *certainly covered with an ample supply of water*, while in one case a rupture resulted very similar to that in the boiler under consideration, of which he begged to hand in a sketch; and by the last witness, Mr. Hollick, leading draughtsman, we are informed that he was on the platform in the engine-room at the foot of the first ladder, and saw the steam and ashes coming out of the stoke-hole. That he had got up a few steps of the ladder when he was overtaken by the steam, *and blown up on to the deck.* At 4·17 P.M. there was half a glass of water in each gauge at the boilers. That was the proper quantity. A few seconds before the explosion the steam pressure was 75 lbs., and that was the highest the witness registered during the day. He noticed the state of the water-gauge while the ship was running the first mile under high pressure. He quite concurred in the opinion given as to the cause of the explosion. The time that elapsed between his seeing the water-gauge for the last time and the occurrence of the explosion was about 20 minutes, which would be a sufficient time to account for the water becoming short.

To sum up, then, there was first a flash of light, the cause of which it would be, perhaps, difficult to determine, but evidently it preceded the steam, soot, and ashes, and the accident happened on turning to run the third mile under high pressure, during all which time the boilers were under high pressure, and the exhausted high pressure steam was "turned into the *chimney, whereby the draught was very much increased,*" which last few words, in my opinion, fully explain the cause of the rupture in the boiler.

We are dabbling with *the* agent (electricity), whilst of its nature we are in the most profound ignorance, and in which state of bliss the scientific world persists in remaining, be the consequences what they may. It is no doubt within your recollection that in the year 1845, before my experiments with the "hydro *electrical* boiler" at the Royal Polytechnic Institution (see Journals of September 25 and October 23), we were constantly told by the lecturer that if the locomotives of railways were insulated, the same as that boiler was, flashes of light would be constantly seen issuing from them, the construction of that boiler having been suggested by an accidental flash from a locomotive boiler, but very soon after my experiments the boiler was left in the cold shade for a short time, and then removed to some dark corner, or sold as so much old iron; and from 1845 to the present time, so far as I am aware, not a word has been uttered by the scientific world respecting the high electrical condition of high pressure steam. Bad stoking, we are told, will produce priming as much as anything else, for the obvious reason that good stoking consists in maintaining an equable combustion; and as the turning of the steam into the chimney added the draught of a locomotive to that of the funnel, *which was already sufficient*, an amount of incandescence was created possibly sufficient to isolate the water from the crown of the boiler; and, if so, in proportion as the plates heated that isolation would, of course, increase, whilst the water being isolated might prevent priming, and thus the victims of the imprudence, not to use a stronger term, were ignorant of the created mischief.

In former boiler explosions the vessels have not only been shattered, but actually *lifted* out of their beds, and hurled to considerable distances, and in one instance a boiler, and that a condensing one, was lifted bodily out of a steamer, and sent flying to the top of a high wall at some considerable distance, whilst the hull of the steamer was not in the least injured; and as the pressure of steam, as commonly understood, is equal in all directions alike, evidently that effect was produced by some other agent than steam. To these facts I have long since directed the attention of the Manchester Steam Users' Association for the Prevention of Boiler Explosions, and as we are now told by Mr. Fletcher, their engineer, that he has met with *numerous cases* in which furnace crowns have been injured, though certainly covered with an ample supply of water, a detail of some of those cases could not otherwise than prove highly instructive. Unless I am under a great misapprehension, a furnace might be constructed that shall render bad stoking next to an impossibility, and prevent priming, or the over-heating of the crowns of boilers, with the saving of at least one-quarter, if not one-half, of the fuel now consumed in the generation of steam. But then "great men" must be shown to be in the wrong.

Mr. Rawlinson, however, in his recent enquiry into the cause of the nuisances of the Aldershot sewage farm, *volunteered* the opinion that corn could not be produced by the application of sewage by irrigation, a fact I have kept under notice since 1848; it is, therefore, to be hoped, the time having at last arrived when something must be done with the sewage of towns, that ere long truth will have a hearing to the demonstation that England can feed her multitudes, and keep for other purposes the gold now exported for food.

FRANKLIN COXWORTHY,
Wrecclesham, Farnham, Dec. 25. Author of "Electrical Condition."

INVESTMENT AND SPECULATION.

SIR,—Mining, although one of the principal sources of our national wealth, is not only thought of as speculative, but, usually is considered more risky than any other reproductive expenditure of money. There is a great deal of force in the prejudice; but, on the other hand, in justice to mining, it ought to be conceded that risk attaches to everything, and, therefore, that the risks of mining are only risks of degree. This should raise the proper question, Which is the greater risk—mining or underwriting, general business, commerce with foreign countries, or putting money into any of the miscellaneous companies with limited liability that from time to time are put upon the market? What are the risks of mining? They are various, and often serious. To begin with—the miner may say that from first to last he does not know what may happen; he can never rid himself from the apprehension of evils that may never come, and that according to the law of probability should never come. Those risks are ultimate feelings very terrible in their nature, and that do not admit of being analysed. Next, the pioneer risks money on the result of his explorations, and afterwards a further sum in "costeaning" and proving lodes. Then the miner working on "tribute" risks a great deal on the improvement of the mineral in his "pitch;" or, if at "tutwork," he risks a continuance of the stratification, or an improvement in the stratification for a "sturt." As for the smelter or metal purchaser, his risks often approximate to those of the miner; tin and copper particularly being always in a lesser or greater state of chronic market-price fluctuation. Lastly, there are the owners, or shareholders, whose risks are often in excess of those of the smelter and the miner. The owners, or shareholders, incur risk in selecting their mines, risk in the nature of the strata, risk in estimating the productiveness or value of the lodes, risk in the realisation of the produce, risk in the price of labour and the cost of supplies. Such is the list. How does it compare with underwriting, general business, commerce with foreign countries, or putting money into any of the miscellaneous companies? Generally, it would be enough to refer to the gazetted bankrupts at the close of the last and beginning of the present year, asking how many of the bankrupts are connected with mining, or how many of them may trace their misfortune to mining? It would be, of course, a rash assertion to say that their misfortune is owing to want of connection with mining; but it certainly does appear that mining furnishes fewer names to the *Gazette* than almost any other industry of the kingdom. The underwriter often falls. The man of business often falls. The merchant often falls. The investor in miscellaneous companies often pleads that it is owing to such connection that he finds it necessary to pass the "screen." In short, mining is no worse than other enterprises, and money locked up in mining enterprises is just as well entitled to be regarded as invested as money locked up in ordinary business pursuits. There, in truth, is no more speculation in mining than in ordinary business pursuits. As an investment, mining may not only be trusted in for dividends, but for a high rate of interest—provided only that it is pursued, like other business callings, for legitimate mining produce, as distinguished from market price premiums. Much demoralisation has been occasioned by premiums, and it would be well were they to be more generally and strenuously disapproved. In lieu of premiums there should be adjustments of the market price of shares, resting on the firm basis of the relation of the productiveness of the dividends to the market price of the shares. For example, the shares averaging 10 per cent. return should be found in one category, those averaging 15 to 20 per cent. and more in other categories. The investing public would then see what they are about, and feel themselves treading on sure ground; whereas mere scheming for paltry premiums divests mining of its purely commercial character, and frightens persons from embarking in it whose cheque-books would otherwise be ready. Among investors the feeling always is to look to their property for profits or interest, and not to trouble themselves about the price that the shares may command. Moreover, there is this further to be said in condemnation of premiums, that as long as there is a desire for them there will be found persons to set on foot schemes which have no commercial purpose—an evil of the first magnitude; one with a strong tendency to increase, and one which it behoves the earnest miner and mining capitalist to discourage and, to the extent of their influence, to repress.

A few days since "Justice" made the remark that—"There can be no doubt, anyone who looks around him cannot fail to perceive that a spirit of speculation and gambling has taken hold of the minds of large classes of the community. Men who were wont to be satisfied with moderate gain and safe investments seem now to be animated by a spirit of greed after gain, which makes them ready to embark their fortunes, however hardly gained, in the vain hope of realising immense returns on premiums on shares, and of making more than the safe and reasonable gains of capital." This remark accurately describing the situation some months ago does so no longer. For within the past few weeks one of the best non-mining companies has been put upon the market with all the country influence of one of the strongest country banks, without attracting more applications than for fifty shares. To the customers of the bank in question circulars were sent, and to the friends of the influential directors circulars were also sent, with practically no result. The mad fit is over. What investors want is safety, with good dividends; of speculation, in the wild sense of the word, they are tired—satiated. American securities have been strongly recommended to them, but in apparent ignorance of the fact that the recent decline in the gold premium has brought American commerce and trade to the verge of bankruptcy. Articles on which duties were paid three months ago—as iron, hides, East India produce, &c.—are now, by the force of the decline in the gold premium, depreciated to the extent of 25 per cent. And further depreciation of the gold premiums threatens all but univeral ruin throughout the United States. Obviously, therefore, investors are not likely to regard American properties with satisfaction. What are they to do? Regarding ordinary home investments with distrust, what better opening than well-selected British mines? There are numbers of such mines that present no risk whatever; many of them offer reasonable expectations; any of them will return more than the much-vaunted Turkish and Egyptian bonds. The difficulty is in imparting confidence in mines; in disabusing the popular mind of the belief that a peculiar hazard attaches to mining property; in giving to mining property the character of investment. If this letter should in the least contribute to that end I am sure many of your readers will be pleased, for it is now a general wish that mining should receive and merit more of the confidence of the capital of the country than as yet has been accorded and enjoyed. CHARLES THOMAS.

3, *Great St. Helen's.*

REVIVAL OF MINING IN CORNWALL.

SIR,—The district of Marazion is once more likely to assume some importance in the mining world. This district during half a century stood pre-eminent in the county of Cornwall for the richness of the quality of the copper ores raised from the mines, and to the depth of from 50 to 100 fathoms below the adit, or day level, yielded great quantities of very rich ore. One lode in the immediate locality yielded from six to seven millions sterling in copper ores! In one of these mines a two month's sampling or returns, 600 tons, fetched 37*l.* 18s. 6d. per ton, unusual in the history of mining of the present day. It has been stated that six men could work abreast in the end in a lode yielding copper ore of from 40 to 50 per cent. of metal in this mine. A parallel lode in the same neighbourhood and basin, a little to the south, has recently been discovered, varying from 5 to 8 ft. in width, and opened on for about 100 fms. in length, possessing all the indications of an immense deposit at a greater depth of the richest quality yellow ore. A reduction in the royalty or dues by the lords of this mine enabled the lessee, after several years' explorations, to form a highly influential company to work this property with spirit, and the owners of the soil will, doubtless, be liberally rewarded, as operations have been commenced with spirit. This important discovery will, no doubt, lead to other operations in this district, where other lodes of equal promise are known to exist. Liberality on the part of the lords will enable enterprising men to bring capital into this district, as well as embarking in distant countries.

There never was a time to embark in mines worthy the attention of capitalists equal to the present, labour being abundant, as well as machinery and materials of every description. The loyalty or dues has been reduced in some districts, to enable capitalists to meet the competition of foreign nations, and many rich mines will in future be discovered in districts in the county of Cornwall which have been for several years under a cloud. Difficulties can always be met and surmounted by men of enterprise when encouragement is given them, and industry is generally rewarded. Industry is, no doubt, the secret of cleverness.—*Jan.* 11. A. BENNETT.

GREAT ROCK MINE.

SIR,—In your valuable Journal you have always allowed the subject of legitimate mining to be advocated, advancing thereby the interests of a large class of our fellow-countrymen. Having occasion to be near the Great Rock Mine yesterday, and being told in the village of the large quantity of ore being raised, and that dressing operations were commenced, stimulated me to go and see, which I did. I found the manager, Capt. Kemp, on the works, who most kindly and courteously accompanied me over the surface workings. I was surprised to see the quantity of lead stuff at surface, and the almost completion of the water-wheel, with all the appurtenances for drawing, crushing, and pumping all put up in so short a period, in a very substantial manner, and bestowing great credit upon the manager. The floors are being laid out, and can be easily extended upon as the increased returns may require. As far as I could see, and from what I heard, the lodes and indications are highly gratifying; in fact, all the phenomena seen in the celebrated Llanidloes mines, a district I am fully acquainted with. The driving of the 12 fm. level is a great feature, as it is shortly expected to come under the run of ore seen in the upper workings, which will greatly enhance the value of this important mineral property. There is a comfortable house almost completed for the manager, which is absolutely required, as it is essential that the manager, Capt. Kemp, be on the spot, and to whom I beg to add my testimony for the ability and activity displayed, whose respective drivings, &c., and the skill in the machinery erected plainly prove, whether outlay of money or time be considered.

I should add that, owing to the great advantage derived from the lodes being so closely associated as to be easily commanded by one sett of works and machinery that if the capital be judiciously applied in the right direction (judging from analogy), there will be ere long a mine opened up in every respect likely to prove something beyond an ordinary mining investment.

Mold, Jan. 12. R. H. C. VERRAN, M.E.

ter of an irregular jumble of rock, with rich stones of ore.' How important to find that there *are* 'rich stones of ore.' Your advertisements and letters to me are very impudent, but Impudence herself could not ignore the existence of 'rich stones of ore,' in the face of the fact, patent to all London, that Mr. Crofts, of Finch-lane, has a rock of about 5 cwts., sent from the mine as a sample of the ore now being raised, which Dr. Phipson has assayed, as appears in the Journal, and proved to contain from 8 to 27 per cent. of copper, besides considerable quantites of silver, and giving an average *money value of* 10 *guineas per ton* (see the Journal, Dec. 24, 1869). But you say the deposit is 'an irregular jumble of rock.' Were this really so, I apprehend it would show a disturbance of the ground, which perhaps could be endured so long as the 'rich stones of ore' continued. But all my enquiries concerning this mine, until this 'Daniel came to judgment,' had led me to think that the rock of the Virtuous Lady Mine was compact and solid, and the stratum so regular and firm that no timber whatever could be required in working it. I am not responsible for this statement, but I do not doubt that those who are directly interested in the mine, and know its character, will be found ready to vindicate their statements, and to them I leave this point. Indeed, I might have left the whole matter in their hands, and have only felt called upon to reply to your letters to me, because I think it is time the share-dealing interest was purged from pseudo-advisers and superlative moralists, who think the investing public to be as great fools as superlative moralists, who think the investing public to be as great fools as these advisers themselves are, and whose audacious ignorance makes them too contemptable to be noticed in any other but their true character.

You have ventured lately to malign the character and prospects of several mining undertakings, and if the law against slander is as potent against the libellers of property as against the libellers of persons the parties interested in these undertakings will, no doubt, see to it. So far as the Virtuous Lady is concerned, you appear to me to be as ignorant as you are audaciously impudent. Yea more, you are ignorant where you would dismiss your office boy were he equally so. In your letter of the 4th inst. you say 'The shares are not from present appearances *worth one shilling*, and whoever buys to hold *must expect continued calls*.' That is, must expect 'continued calls' in a limited liability company, with all the calls paid up, and upon which no possible further liability can arise. 'Oh, wise young judge! a Daniel come to judgment! Yea, a Daniel!' Well in the letter of the 6th you add this postcript.—'P.S. If you want to buy 50 or 100 shares in Virtuous Lady at *three pounds five shillings* per share, and can send a satisfactory reference in London, I think I can get them for you.—H. W.' This is really a marvel of condescension. The shares are not worth 1s., but if I want to buy you can get me 50 or 100 at 3*l.* 5*s.* What! in this swindle, this worthless undertaking, floated by 'the gassy efforts of Mr. B.?' This is really too good and too condescending for a man who sounds the deep-toned note of alarm; who says to the public—'*Beware!*' 'For further information apply as above.' Now, Sir, I am no shareadealer, though I have sometimes bought shares, but I feel you will not take amiss a little simple, though unpaid, advice. *Never touch hot pitch.* It is sure to soil your fingers, and may scald you. Never offer to give the public information until you are in possession of it yourself. Even if it should not be very accurate or very profound, a little acquaintance with your subject would prevent you 'awakening the wrong man.' When you do venture to give advice to the public, do it with courtesy and truth, and then you will have no occasion to fear for the use that may be made of your letters. If I find your future career gives evidence of improvement, I shall be glad to add to my advice on a future occasion. GEORGE MURRAY."

H. Waddington, Esq.

[ADVERTISEMENT.]

VIRTUOUS LADY MINE.

SIR,—I had intended to write no further respecting this mine, but leave a little time to prove to the public the correctness of my predictions; but as several unprincipled persons are using their utmost endeavours to injure both the mine and myself, with most cruel slander, I think it my duty to warn the present shareholders, so that they may not be induced to dispose of their shares, even at the present ridiculously low price—5*l.* per share.

I spent several hours underground last Monday, and really, if it be possible, my faith was still further increased. At several points of the mine, where the tributers are at work, the places are fairly blocked up with ore and orey stuff. The bad weather has hindered us in completing our hauling machine, which will raise the ore from several shafts; we expect to put it to work next Monday, and you will soon hear of us in the Ticketings. Every pitch set is looking well. Hawkes's lode, the great discovery, is richer than ever, and in the desuing yesterday a branch of solid ore 7 inches thick was discovered, independent of the splendid course of ore already laid open. On Monday, in my presence, Capts. Gifford and Horswill set an end to drive in entirely new and whole ground, at 7*l.* 10*s.* per fathom, in a very kindly looking part of the lode. What is the result? Last evening Capt. Horswill came to my house to inform me that already they were breaking large rocks of copper ore. What is to be said in the face of all this? There is no prediction here. Do I lie? Let my enemies openly come forward and say that I do.

It is amusing the amount of prejudice that has existed against this mine, simply because the masses of ore have been found in "flats." Now, the question is, what are these "flats?" I will explain presently. It is quite clear that even hundreds of thousands of tons of copper ore have been taken away from the mine, as the numerous drivages and excavations could not have been made without an outlay of millions of pounds sterling; and, further, what has become of the stuff excavated? The debris outside of the mine, thrown out of the old workings in a loose state, would not even one-tenth part fill the mine. But now for the "flats:" the secret of this is contained in a nutshell—if in any other mine, a cross-cut was being driven to intersect a lode, and a branch or feeder of ore 2 or 3 inches thick happened to cross the level, it would be hailed with delight, not merely for the value of the ore, but as an indication that the lode would be cut rich, as nothing tends to produce a rich lode more than good branches dipping into or feeding it. With the Virtuous Lady Mine, these flats are nothing more nor less than feeders, only because instead of being 2 or 3 in. thick they are sometimes 10 or 20 ft. solid ore, and turn out hundreds of tons of copper of the richest quality, the mine is ridiculed by some for the lodes not being well defined. Twaddle; what trash! The main lodes have never yet been seen only a few feet from surface, and nothing can be better defined; they are one mass of gossan, prian, and peach, something similar to the Devon Consols, only that some of the gossan has turned out large quantities of rich black ore. We are now driving a cross-cut, which will intersect the great south lode at 20 fms. from surface, as we have the benefit of its course under the hill. For the past four weeks an experienced diallcr has been engaged upon the mine, and we are informed by him that 6 fms. further driving will cut the lode. Now, here is the rub—what are we going to discover? I know very well mining is a speculation, and it is possible to cut the lode as poor as a rat; but I say we shall have one of the richest lodes ever discovered in England. Now, do not call this a prediction; what I state is gathered from my own personal observations of the mineral indications at surface, and a thorough examination of the workings underground. The Virtuous Lady lodes are parallel with the Devon Great Consols, and I say that my firm opinion is the Virtuous Lady lodes are the great champion ones of the district. If such be the case, what is to prevent this mine from being a far richer and more valuable property than the Devon Great Consols?

Come, here is a poser for some of you practical men who have condemned the mine, and yet never seen it; if the branches, or feeders (or "flats," if you like to designate them as such) are so wonderfully rich, what will the lodes be? And now once more, at about 50 fathoms deeper at the grand junction what will be the result? We shall have the richest mine ever discovered in the wide, wide world. I hear that some of my enemies, with their hired servants, in their jealously and disappointed rage, are going to ruin the mine and myself by letting the world know that the lodes are nothing but "flats." Now is the appointed time for you to win fame. Come on a dozen mining men of you; inspect the mine, insert your reports in the Journal, and sign your names, and the future will prove who is correct. Yes, and it will not take long to learn the secret of the great south lode, as about six weeks' work will intersect it, so that the public have not to wait long for the fulfilment or otherwise of one of my many important prophecies.

And now for another matter, called the BRENTOR MINE. This is a most promising property, and I never introduce anything to the public in which I am afraid to spend my own money. Three of us have alone expended over 3000*l.* upon this mine, and we have now resolved to form a limited company of the affair, in 10,000 shares, at 1*l.* each. We ask no cash, although we have laid out so much, and the machinery and plant upon the mine would, at a knock-down sale, fetch at least 500*l.* to 700*l.*; we shall want 4000 fully paid-up shares, and only 3000 shares will be at first issued. I will take the first 250, and my 250*l.* is at once ready—in fact, I am now making arrangements with Messrs. Nicholls, Mathews, and Co. for an additional boiler and fly-wheel, &c., for the engine, by which we expect to be able to prove the mine some 20 to 30 fathoms deeper, and we shall soon resume the sinking of the shaft. Unlike the Virtuous Lady, every mining man speaks well of this property.

I will just mention that the shaft is sunk about 16 fms. from surface. Above the 12 we discovered and sold 500 tons of the richest quality iron ore; but suddenly, without the least notice, we came down upon a mass of sulphur mundic. The lode at the bottom of the shaft is almost 8 ft. wide, and is composed of sulphur, iron, peach, prian, and a little copper ore. Just to show how copper exists in sulphur and mundic, I will inform you that Dr. Phipson made an assay of some copper stuff taken from the Virtuous Lady Mine, which contained 16 per cent. of copper, 32 per cent. of sulphur, and 33 per cent. of iron, the remainder being schist rock. Many, myself included, think that 10 to 20 fms. deeper we shall have a rich course of copper ore. In a week or two a prospectus will be ready, and a copy of it will appear in the Journal. I may add, the lode has so remarkably improved during the last few feet that the sinking of only 2 or 3 fathoms may discover saving profitable work for copper ore, and I believe that in a few months the shares will be at a good premium. Any persons desirous of embarking in this enterprise can have shares reserved for them, on writing me their intention, with the number they desire to hold; and when everything is ready for the fair launching of the company they will be allotted in order of application.—5, *Abbey Mead, Tavistock.* THOMAS J. BARNARD.

VIRTUOUS LADY MINE.

SIR,—Hearing that Capt. T. Neill had inspected this mine for a shareholder, I have obtained from him a copy of his report, which I enclose to you for insertion in the *Mining Journal*. You may rely on the truthfulness of this report. Capt. T. Neill was for 23 years manager of Devon and Cornwall United Mines.

Tavistock, Jan. 12. J. L. PEARCE.

Cross Way House, Albaston, Dec. 27.—Sir: According to your request, I inspected the Virtuous Lady Mine on Friday last, and the following are my remarks upon it:—I found the mine to be clear of water about 19 fms. from surface. There is one end driving west, by four men, at 8*l.* 10*s.* per fm., which is called Metherell's end, on what is called a lode, but the ground is hard and unproductive. Secondly, they are driving a cross-cut south, by four men, at 6*l.* per fathom, about 10 fms below the adit, towards the south lode, and they have about 20 fms. further to drive to cut it. The south lode, in the adit, has been driven on about 30 fathoms east, and in places has produced some good gossan, prian, and black ore, but I could see no place in the drivage that would pay for working, but, of course, when the lode is intersected by the cross-cut below, an improvement may take place. In the old workings or caverns they have three pitches working in the backs, or in other words, arches of ground left by former workers, at an average tribute of 13*s.* in 1*l.*, but I could not see sufficient copper ore for the men to earn wages. There is also one stope—Hawkes's stope—working in one of the old backs; the lode or orey part is about 9 ft. in length from east to west, and worth about 4 tons of ore, or 20*l.* per fathom. This cannot go down, as the ground is taken away below for some fathoms, but how far it may go upwards no one can say. This embraces all their present underground workings. As to the number of tons of ore broken, they have at surface from 18 to 20 tons, worth about 5*l.* per ton. Underground I should think about 10 tons, quality not so good, from which I think you will be convinced there will be no chance for a dividend in April next from ore they may return, unless they meet with an extraordinary discovery, which I hope they may. In conclusion, I may say I have been in the neighbourhood for more than 20 years, during which time the mine has been worked by three different parties, and good parcels of ore sold therefrom, but not sufficient to pay cost of working, but I have no doubt, by sufficient outlay being brought to bear on sinking and opening out deeper levels, that improvements may reasonably be expected.—THOMAS NEILL.

HAMMETT MINE.

SIR,—I have perused with much interest the letter which appeared in last week's *Mining Journal*, in which "Observer" has corrected "one or two errors," or presumed errors, that I had made in a little sketch I sent to you of the doings at St. Neot. In spite of the studiously moderate language employed, I cannot resist the impression that the writer is actuated by some strong animus for which I cannot account. At the same time, I must acknowledge the compliment that he has paid me by the trivial nature of his corrections. He is kind enough to impute my errors to "anxiety to laud Capt. Peter Temby, and ignorance of the locality;" but I cannot, in fairness, excuse my statements, either on the score of ignorance of the locality or the traditions of the neighbourhood. Whenever any circumstances have come under my personal observation likely to interest your readers, and to attract capital to the development of our British mines, I have trespassed upon your space, and have always endeavoured to give praise where it was due. Nothing could be more foreign to my nature than to "laud" one man at the expense of another. "Observer" asserts that the discovery at Hammett was made some eight or nine years since by Mr. Peter Roskilly, and that Capt. Temby "appeared not to know anything of it until about a year ago, when he was asked to go there and take samples of the stuff on the surface," a statement which appears to me irreconcilable, and evincing a disposition to laud the "departed" at the expense of the living.

I would enquire of "Observer" whether Mr. Peter Roskilly was a practical miner, and if his opinion upon minerals would have been regarded as valuable by any Cornishman of experience in mining? I was perfectly aware that, at about the period mentioned, this mine was worked under the management of Mr. Roskilly, and that the adit was commenced to cut the lode worked for "copper" at the top of the hill; and, unless tradition be false, Capt. Temby was the agent who drove the adit, discovered the tin, and informed Mr. Roskilly of the fact. If this be true, how could Capt. Temby not know anything of the discovery until about a year ago? And if, as I have always understood, Mr. Roskilly was only a clerk to Mr. Peter Clymo, what claim could he have had to the merit of the discovery? As well might any London secretary or manager take credit for the various lodes discovered in the mine with which he happened to be connected. If, as it appears to me, "Observer" would desire to laud the mere office agent, at the expense of the captain, I do not think that his efforts will be favourably appreciated by either "bal cap'ns" or miners generally—"*Palmam qui merrit ferat.*" "Observer" would evidently imply that Mr. Roskilly should be regarded as a benefactor to the working miners "who require public support in their undertakings;" but may I ask, just for information, how much tin was sold, and the nature of the benefits received at his hands? I hold that any person who is the means of starting a mine, and thereby provides employment for numbers of our hard-working mining population, confers a great boon upon the country, but in this particular instance is Mr. Roskilly fairly entitled to the praise?

While appearing to be delighted at hearing of any mining success, "Observer" states that with the present appliances it is strange that "we do not hear of any tin having been sold," thereby throwing a sort of cold water inuendo upon the success of the present company. Now if, as from his style I should surmise, he be a practical miner he must be well aware that tin dressing is a very nice process, requiring machinery which it takes time to construct, and that the more complete the means the more profitable the result. Doubtless ere this, had the mine been under the management of market operators, there would have been a sale of tin, in order to enhance the price of the shares, but the shareholders are satisfied that the best means are being adopted to promote their interests by delaying the finishing process in dressing the ore until the necessary sheds are erected. When we so frequently read of setts being described as adjoining successful mines, although miles apart, it is really quite amusing to find "Observer" taking objection to my stating that Ambrose Lake was *almost adjoining* Hammett, when the distance between the two setts does not exceed half a mile. Would not "Hypercritical Observer" be a more consistent *nom de plume?* As to the definition of "several," I must refer my critic to any dictionary, after consulting which I do not think he will consider the word misapplied. A MINING TOURIST.

HAMMETT MINE.

SIR,—The letter in last week's Journal, signed "Observer," contradicting the paragraph which appeared in your paper of Dec. 18, and denying that I was the founder of the important tin discoveries which have taken place at St. Neot, I do take the credit for the great discovery of tin made, and now laid open, at the Hammett Mine. I beg to inform "Observer" that I was the agent of the mine when the adit was driven by Mr. Roskilly, and I reported to him my discovery of the tin in this place. If "Observer" is not satisfied with this statement, I have now in my possession the mine books, and other evidence sufficient to prove to him, or anyone taking interest in the matter, that I did discover the the tin-bearing elvan course in 1861.—*St. Neot, Jan.* 11. PETER TEMBY.

ABERDAUNANT MINE, &c.

SIR,—In your valuable Journal of last Saturday I saw an attempt at an attack on a remark I had made in my advertisement of the preceding week—a tremendous volley of words, whose coherence I am quite incapable of comprehending, and the sense of which none of my friends can recognise. When I find, Sir, that shares are held out to the public at double the real price, and offered at this reduction by the *supporters* of the mines, what is my inference? There is something requiring investigation. I visited Aberdaunant Mine some time ago, expecting to find from 150 to 200 tons of lead ore ready to dress, as I was assured I should. After carefully viewing the two piles, without prejudice, I estimated the quantity at about 20 tons. I say nothing of the prospects of the mine, or the manner in which it has been worked; nor have I seen any report from the agents that they have 100 tons at surface. My estimate was nearly confirmed by a practical miner who inspected the mine the following day, and who valued the lead at surface at 25 tons.

Of Hammett, your correspondent, "Observer," asks, What have they done? Tin strings, like the thread of a spider's web, can be found in elvans and granite from St. Neot to St. Columb. The mine is said to be worth 36,000*l.*—for what?

In my advocacy of mining as a second—yea, sometimes the first—source of a nation's wealth I yield to no one, for to deny it one must have never possessed the five senses; but to discuss any other means of inducing the public to invest their money than by fair, true, and faithful representations, founded on the best practical opinions, is idle and a waste of your valuable space, and probably of the time of those who read, expecting to find a new idea, instead of a self-evident fact.—48, *Threadneedle-street, E.C., Jan.* 13. H. WADDINGTON.

[For remainder of Original Correspondence, see this day's Journal.]

FOREIGN MINING AND METALLURGY.

The principal Belgian construction workshops have been well provided of late with orders for steam-engines and general machinery. Thus MM. Cail, Halot, and Co. are to deliver this year apparatus for five important sugar works. There is also a sustained demand for iron bridges, but it is complained that prices are not very remunerative; several new affairs have just been concluded for Hungary and Italy. Russian railway companies have entrusted new orders for rolling stock to the Belgian works. Thus M. Charles Evrard, director of the Belgian Railway Plant Company, has received an order for 200 wagons for the Tzaritzine line, 400 wagons for the Woronesch and Rostoff line, and 46 locomotives, with their tenders, for the same line. It is not improbable that the number of locomotives in this latter contract will be increased to 62; the contract will, probably, be divided by arrangement between the Belgian Railway Plant Company, the St. Leonard Company of Liége, and the Couillet Company. We have enumerated a contingent of orders, which will occupy those three great concerns for some time.

The last few days have not been a very interesting period in connection with the French iron trade, stock-taking having produced a sensible slackening in affairs. The works of the Haute-Marne have only received during the last few days some re-assortment orders for merchants' iron, but they have not the less worked with activity for all this, as the execution of several contracts concluded some time since has fallen somewhat into arrear, and a certain lapse of time must take place before they can be completely fulfilled. Under all the circumstances, the Champagne forges can afford to wait awhile for the new orders which, it is expected, will not fail to reach them. The general state of the markets of the Haute-Marne group leads to the expectation that the slackening in affairs which has been mentioned will be only temporary, as, upon the whole, there is still a good demand for almost all articles. Mixed machine, No. 20, is obtained with difficulty, at 9*l.* 8*s.* per ton; No. 19 is worth 9*l.* 4*s.* to 10*l.* 4*s.* per ton; and No. 18, 10*l.* 12*s.* per ton. The demand for iron wire does not lack activity; 10*l.* to 10*l.* 4*s.* is paid currently for No. 17 at the works, and some works have even placed their quotation at 8*s.* per ton more than this. Point and chain iron is easily run off. The foundries do not want work, and scarcely one of them can be said to be idle, as pipes and other large castings furnish abundant elements of employment. Advices from the Meurthe and the Moselle report great firmness in prices for white pig, which is held at 2*l.* 15*s.* 2*d.* to 2*l.* 16*s.* per ton at the works; for grey speckled pig for refining, 2*s.* 6*d.* to 3*s.* 4*d.* more per ton is paid. There is nothing astonishing in the firmness observable in coke in the Meurthe and the Moselle; it is sufficient to state, by way of explanation, that producers have had to submit to an advance in coke, which can but be reflected in the price of pig. It is understood that the Pont-à-Mousson Works have obtained from the Eastern of France Railway Company a contract for 200 tons of pipes; the terms of this contract are not yet known. The Paris iron market has been quiet.

The continental copper markets have commenced the new year with a certain feebleness. The French markets have maintained a quiet and expectant attitude. At Havre 25 tons of Chilian in bars recently made 68*l.* 4*s.* per ton, Paris conditions; but at Havre, as well as at Paris, affairs display little activity. At Marseilles, Toka has made 70*l.* per ton in warehouse; Spanish, 68*l.* per ton for consumption; and refined Chilian and Peruvian, 72*l.* 16*s.* per ton, while rolled red copper in sheets has brought 78*l.* per ton. At Amsterdam, Drontheim has made 45 fls. per cwt. At Amsterdam and Rotterdam, Banca tin has made 64¼ fls., and it was not expected to go higher. The total stock of Banca, Billiton, and Straits tin at London and in Holland at the close of 1869 was 6780 tons, without comprising 47,000 ingots of Banca under sail, or about 1380 tons, making altogether 8160 tons; at the close of the year 1868 the corresponding total was 7448 tons. The price of Banca at the close of the year 1869 was 64¼ fls.; at the close of the year 1868, 64 fls.; at the close of the year 1867, 52¾ to 53 fls.; and at the close of the year 1866, 50¼ fls. The imports of Billiton rose last year to 53,437 ingots, showing a considerable increase upon 1868; in 1859 these imports were only 5808 ingots, and in 1855 they were still smaller—210 ingots. The exports of Banca from Dutch ports attained in 1869 a total of 144,305 ingots, against 157,723 ingots in 1868. The most considerable export year was 1866, when 188,855 ingots were exported. Zinc and lead have not presented much change of late; on the French markets prices have ranged from 20*l.* 4*s.* to 20*l.* 8*s.* per ton.

The exports of coal from Belgium during the first ten months of last year were smaller than the exports for the corresponding periods of 1868 and 1867. The diminution arose more particularly in the deliveries to France. This will be seen by the annexed table, which illustrates the exports of coal from Belgium during the first ten months of the last three years:—

Destination.	1869.	1868.	1867.
Russia .....Tons	1,500	—	—
Zollverein	11,903	9,727	5,716
Low Countries	100,083	94,409	83,973
France	2,781,047	2,893,357	2,818,418
Switzerland	—	—	11
Turkey.....	101	—	—
Other countries	3,222	5,696	6,445
Total	2,897,856	3,003,189	2,914,563

The falling off in last year's figures does not appear to have occasioned the Belgian coal-producing interest much, if any, uneasiness. It is partly explained by the fact that during several months of 1869 affairs with France were much less active than usual, the warehouses of the great centres of consumption having remained encumbered to some extent with stocks at the close of a not very rigorous winter. It should be remarked that the statistics for the whole of 1869 have not yet been completed. The last two months of the year constituted a period of great activity, and when they are taken into account the comparative results given above may be materially changed. The exports of coke from Belgium in the first ten months of last year show an important advance as compared with the corresponding period of 1868; thus these exports were 545,042 tons in the first ten months of 1869, 443,596 tons in the first ten months of 1868, and 440,841 tons in the first ten months of 1867. The scarcity of rolling stock on the Belgian railways is still the subject of great complaints on the part of Belgian coal-owners. The inadequacy of the rolling stock on the Belgian State lines is especially complained of, and it is affirmed that in 1869 each wagon or truck had to carry upon the State lines 777 tons, while in 1868 the corresponding quantity carried was only 692 tons, and in 1867 only 659 tons. It had been proposed this year to impose an octroi duty on all coal entering Paris. This was a matter of considerable interest to the Belgian coal trade, which has learnt with satisfaction that the Council of State has decided to continue to exempt from octroi duties coal imported for industrial purposes. The Belgian coal markets have not presented much change during the last few days. The week has brought, like its predecessors, a contingent of orders, emanating from the sugar works, which specially require supplies. Prices have not materially varied; freights remain at 7*s.* 3*d.* per ton for Paris.

MINERAL RESOURCES OF NORTHERN MEXICO.

From twelve years residence in Mexico, and from having travelled over a great part of the country, it may fairly be presumed that Mr. C. Chipman is thoroughly competent to pronounce an opinion upon the position in Mexico of the branch of industry with which he is connected, and it is not difficult to discern from the interesting little volume* which has just been issued by that gentleman that the author is well acquainted with the subject on which he writes. He observes that as the searcher after mineral knowledge wanders from place to place through the country he is struck with wonder at the sight of the number of lodes bearing silver, gold, iron, lead, copper, tin, cinabar, and various metals known to science and used in the arts; and that if one-half of the known silver lodes of Mexico were worked as they should be, by modern machinery, and the skill that science and practice imparts, the yield of silver and gold alone would reach 200,000,000*l.* annually, and employ in various ways 10,000,000 people.

With regard to the celebrated mineral districts of Guanajuato, Zacatecas, Real del Monte, Pachuca, San Luis Potosi, Pabillon, and others, Mr. Chipman says nothing, considering that it would be but repeating what has been so well said by Ward and others, whose descriptions are read and quoted by almost everybody at the present day, whenever they write in regard to silver mines, nor does he attempt to give a detailed history of every vein north of the said places which has been opened and worked to a greater or less extent; but he supplies a good account of the States of Durango, Sinaloa, Chihuahua, Sonora, and Lower California. He considers that there is no part of the world where there has been so many rich mines discovered as in Mexico, and that the States mentioned certainly contain the richest and most numerous of any part of that country. If the American people owned these four States, and the territory of Baja California, the product of the precious metals would be enormous. California, in its best days, would bear no comparison to Sinaloa, and parts of Chihuahua and Sonora, where rich placer diggings exist; yet so lazy and indifferent are the people of those places, that they choose rather to beg, or live on pure corn, and not enough of that, than to wash out gold found near their places of abode. This state of things has lasted for ages, and would last for ages longer, if no progressive race existed as neighbours to these people. Progress is the watchword, and nothing can long withstand the advance of that race which has peopled California, and whose persevering industry has filled the world's coffers with more gold and silver than the Mexicans had ever dreamed existed in their territory. The time will come, and is not far distant, when these indolent people will find themselves within the territory over which the stars and stripes will wave as a beacon and an emblem of freedom and progress.

After describing the district and the situation of the mines, Mr. Chipman discusses the question—Is silver mining a speculation? and concludes that compared with farming the risks are no greater, if so great. He maintains that the agriculturist is subject to lose the fruits of his labour by frosts, drought, too much rain, insects, &c., and the price of his labour is equally as precarious. The mechanic, artizan, and manufacturer are all subject to a decrease in the price of labour, and frequent stagnation of business, which cause many to become bankrupt, and others to suffer from lack of remunerative employment. Mining for silver and gold, if entered into with the same business precautions that are generally observed by business men who engage in mechandising and mechanical pursuits, would present less hazards, and be attended with less failures, than any of the aforesaid employments. He says that investors in mines are too apt to take as truth the representations of every ignoramus and unprincipled adventurer that presents titles and specimens of ore from lodes that have, or have not, any existence. This point reached, the company is organised, machinery purchased, superintendents appointed, with a staff of assistants, without any regard to capability or honesty. Then the putting up of machinery is commenced; and, subsequently, the exploration of the ground. In many cases the exploration reveals neither lode nor ore, and hence the whole outlay of capital is worse than thrown away, and the trusting capitalist is disgusted, and pronounces all mining operations a snare and a delusion.

In subsequent portions of the book the Mexican system of reducing and amalgamating silver ores is described, and the facilities for getting the ore and metal to market explained. Mr. Chipman maintains that all that is necessary for the welfare of Mexico is continued peace; he says that the mental and physical degradation heaped upon the whole people of Mexico by the selfishness and short-sighted policy of old Spain, and the influence of a corrupt priesthood, has all to be eradicated and remedied by education, and a wise course of legislation. Patriotism must take the place of corruption in high places, and vigorous endeavours put forth to change the apathy of the people into energetic action on behalf of themselves. The present system of one individual holding in his own right the land embraced within the limits of one-half of a State, as is now the case, and paying no tax thereon, must be abolished. He attributes the suspension of mining prosperity in Mexico since 1862 to the invasion of the country by the French, but observes that during all the intestine and foreign troubles the Mexican miners alone have been inconvenienced, foreign miners being generally unmolested, and never interfered with, except by the French or Imperialists.

The book throughout is written in a concise and readable style, and will prove invaluable to mine adventurers and capitalists disposed to assist in the development of the vast mineral resources of the district of which it treats.

* "Mineral Resources of Northern Mexico." By C. CHIPMAN, Minero Matriculado de Mexico. New York: Baker and Godwin, Printing-house-square.

QUARTERLY JOURNAL OF SCIENCE.—The January number of this Journal appears to be an unusually interesting one—the articles being of very varied and general interest, and the compiled matter admirably arranged. The first article, by Mr. W. F. Barrett, F.C.S., on Light and Sound, being an examination of their reputed analogy, is one that will be read with pleasure by all classes of readers, no matter what may be the branch of science to which they specially devote themselves; and the same may be said of Dr. Duncan's paper on Idiotcy. In addition to these, there are papers on The Principles and Methods of Sewage Irrigation; On The Total Solar Eclipse of August last; on Instruction in Science for Women; on The French Imperial School of Forestry; and on The Fuller's Earth in the South-West of England. The notice of Scientific Works are of the usual careful and impartial character. In the Chronicles of Science an enormous amount of information is given, and in so concise and lucid a manner that the facts may be stored in the mind with the least possible trouble.

LEVER'S MINING ALMANAC.—For variety and utility of information there is probably no sheet almanac better adapted for the colliery or mine office than this; and the edition for 1870, which has just been issued, is fully equal to any that has preceded it. In addition to the usual calendar matter, there are lists of the officers connected with all the principal scientific and technical societies connected with mining and civil engineering and the iron trades. The almanac contains much statistical information, and is handsomely printed.

INVENTORS' ALMANAC.—The edition for 1870 of the handsome little mounted sheet-almanac, issued by Mr. M. HENRY, Patent Agent, of Fleet-street, under this title, has just been published. Being the twelfth annual issue, it is scarcely necessary to particularise its contents, but it may be mentioned that the chronological information has been extended to the present time, and the official directory and statistical matter corrected to the latest moment, so that it is in every way worthy of retaining the place in the inventors' offices it has so long occupied.

BUILDER'S PRICE BOOK.—The edition for 1870 of "Atchley's Price Book for Architects, Engineers, Contractors, Builders," &c., has just been issued, and appears to have been thoroughly revised throughout—it contains a complete list of the present prices of builders' materials and labour of all trades in connection with building, and various other information of considerable value to the trade. In last year's volume an excellent article on concrete building was published, and this year there is an equally valuable one by a civil engineer on "Iron as Applied to Building Structures." The book is, undoubtedly, one of the most valuable of the class published.

The Royal School of Mines, Jermyn Street.

MR. WARINGTON SMYTH'S LECTURES.

[FROM NOTES BY OUR OWN REPORTER.]

LECTURE XVII.—Having devoted our last lecture to the general outline and form the excavations of the mine may assume, the next part of our subject will be to examine the various methods by which the miners have to make their way through the rocks, or, as they term it, "to break ground." These methods differ not merely according to the hardness of the rocks themselves, but are greatly affected by their liability to joints or planes of division. Ordinary definitions of "hardness," as accepted by mineralogists, cannot be depended upon as giving a clear indication as to the progress which ought to be made in sinking a shaft or driving a level. It must be remembered that the very same class of material, or even the very same rock, may exist in conditions widely different with regard to the facility with which the miners can work in it. The miners themselves, however, divide the ground into five distinct classes, for the purpose of assisting their consideration as to the different means which may have to be adopted in breaking them away, or excavating them. They are as follows:—

1.—Loose or running ground, or "rollig," as it is called in Germany, which means that if you take away a shovelful, more would run down than you removed. The difficulty of ground of this sort is not in the working so much as in the prevention of the material running down too much, and the necessity of holding it back by walling or timbering. Various kinds of quicksands come under this head, which have to be passed through, whether vertically or horizontally. Suppose we were attempting to make an adit or a level, and came to a chasm filled up with quicksand, or the loose detritus which had formed the bed of a stream, the moment it was cut into the material would rush into the workings. Again, in descending from the surface we might get into a mass of quicksand, when the sides would fall in, and the excavation fill up again—a phenomenon noticeable especially in the Lower Red Sandstones of the Permian system. The ground must be secured by tubbing, or spilling, in all these cases, and then the work to be done is simply to dig away the material thus brought down. Works of this kind vary considerably, according to the nature of the material and the object in view. Thus, the loose material may contain useful substances, which it may be desirable to secure. Thus, at Mansfeldt, in Prussian Saxony, certain extremely thin and hard carbonaceous bands are worked over a large area for the extraction of the metal they contain. These deposits belong to the Permian system, and have over them beds of very incoherent material, which, when mixed with water, is apt to cause difficulties of a serious character, partly by running into the excavations, and partly by making great hollows at the sides. Nearer to us are the beds belonging to the same Permian formations which exist in Durham and in the neighbourhood of Newcastle, where great difficulty is experienced in sinking through this "running ground" to reach the coal measures. At the bottom of the superincumbent strata in Durham is the Lower Red Sandstone, running in layers of various thickness, and in some places forming an extremely soft yielding material, full of water, so that when a shaft is sunk through it for the purpose of getting to the coal the greatest difficulties intervene, not merely from the water, which is considerable, but from the quantities of sand rushing into the excavations and choking the pumps—opening also large cavities at the sides, and occasioning imminent danger of collapses, which threaten the extinction of the whole shaft. In other cases "running ground" is encountered near the surface. In the valley of the Rhine, where it is joined by the River Ruhr, at the western extremity of the Westphalian coal field, the alluvium of those two rivers form enormous beds of silt and sand, intermixed occasionally with large stones or boulders, making it difficult to sink tubes downwards, a process of comparative facility were it not for these stones. When tubes can be got down it becomes a mere matter of removal by means of shovels or, perhaps, buckets, and some very remarkable sinkings have been accomplished by a sort of dredging at the bottom of a pit of this kind. In the case of a bore-hole, a revolving cross bar is made to scrape the bottom, and its produce going into bags attached to the bar, the sand is then drawn out. It is necessary, however, to be exceedingly prompt with the tubing, and to keep it constantly up to the boring tool. When the men can work at the bottom of the shaft, or in driving horizontal galleries or tunnels, the only implement necessary is the shovel. The ordinary spade of agriculture is not much used by miners. The handles in the southern and western districts of England are long, while in the north shorter ones are used. All the English shovels are worked forward and away from the workmen, while in almost all continental mines the shovel employed by the fillers at the bottom of shafts or drifts is underhanded, and used as a scraper, as well as to lift the material. In stream works a sort of shovel is used with advantage, called a streamers' fork, and is something like a trident. It takes up the stones and gravel, and lets the smaller portions pass between the prongs, to be dealt with by the stream of water. A great deal of this work thus passes into the hands of ordinary labourers, but all the other work requires skilled labourers or experienced miners.

2.—In the second class of rocks the ground is called easy or fair ground—what in Germany would probably be termed "mild." In this class you would hardly be prepared to find granite, and yet in some of its decomposed states it is quite soft—as, for instance, the china-clay worked on Dartmoor and at St. Austell is so soft that a shovel may be driven some feet into it. Decomposed porphyries fall under this category, as they sometimes yield with the greatest facility to the slightest blow of pick or shovel, although at others they exhibit a considerable degree of toughness, and will stand for a short time after being excavated without props. Chalk, plum granite, gypsum, and rock salt will also maintain itself in like manner; but the spaces opened must not be too large—that is to say, not more than 5 feet high and 5 feet broad; but if even so little as a foot larger either way it would not be safe to leave the walls unsecured. Chambers opened in material of this kind, when left too long, are liable to be attacked with oxidation, and the result would be that portions would split from the sides, fill up the levels, and gradually become very troublesome and injurious, materials of no value becoming mixed up with those which are. In this kind of ground it is usual to employ picks and shovels of various sorts.

3.—Our third division of rocks are not geologically of a different character from the second, but so jointy, or "scaly," as English miners, or "kurzklüftig," as the German miners call it. Although geologically hard, the joints or scales admit the point of the pick, and the rock is thus broken away with comparative facility. This division is worked generally without gunpowder. Coal may be divided between these two classes, some kinds being easy to cut, while others are so hard as to require a considerable amount of force and the use of gunpowder.

4.—In the harder rocks blasting is an admirable aid to the miner, and these harder classes of rock, or what is termed "fest" in Germany, and "shooting" or "blasting" ground in England, constitute the largest proportion of the rocks in which the mineral veins are worked. The processes of blasting used there are also employed in working coal seams, on account of the superior cheapness with which operations may be carried on by means of gunpowder.

5.—That class of rock which is of excessive and exceptionable hardness, and termed "tight" and "close," as well as hard, comprising certain syenites, hornstones, greenstones, quartz, mixed with the metallic sulphides, such as that of the mass of ore worked at Rammelsberg and some of the primary schists. The Norwegian and Swedish gneissose and quartzose schists are often of this exceedingly hard character, so that very frequently no tool could bore them for the purpose of blasting, and, therefore, the old practice of "fire setting" continues to be used to this day in a few districts.

With regard to the first of these divisions I shall have something to say hereafter when treating of the modes of tubbing, spilling, &c. In the second class, besides the shovel, there also comes into play the pick, an implement of very general application throughout the world in one form or other. Indeed, there are some in existence, found in an ancient streamwork for tin, which are composed of materials of the hardest kind used when iron was unknown. They have, however, a singular resemblance to the Cornish pick of this day. The ordinary Cornish pick is shaped so that it may be used as a wedge and lever, while the square end of the head may be used as a hammer. The head is usually about 15 in. long, and the hilt about 2 ft. or 2 ft. 2 in. The head and hilt are not set at right angles, for the miners have an idea that the angle should vary according to the hardness of the ground. The handle, or hilt, should be made of a tough sort of wood, such as ash, and the head of a good class of iron. In metalliferous mines it is the simplest and most important implement employed, and it there varies in weight according to the ground to be dealt with; but 3 or 4 lbs. are the most common weights, or occasionally 5 lbs. If heavier they are found difficult to work laterally or upwards, but in working downward a pick with a 10-lb. head is often used. Having exhibited samples of these and other English picks, Mr. Smyth said that another variety worthy of note is the Saxon one, which is exactly like that used in getting the anthracite coal in Pembrokeshire. In Silesia, where the material dealt with is tolerably soft, the end of the pick is broadened, so as to form a kind of blade. In some mines the point of the pick wears away more rapidly than in others, and then it is not unusual to have a double-pointed pick; but, as a rule, in Cornwall, in Derbyshire, and in the North of England, the single-pointed pick is held to be the most convenient for working in lodes, and where they have to use the poll of the pick as well as the point. The double-pointed pick is essentially the main tool of the collier, but it varies exceedingly in form, principally in obedience to the fancies of the men, but frequently with a view to the peculiarities of the beds to be cut. Thus, the first thing in attacking a face of coal is to "hole" or "undercut" it. Supposing the seam to be 5 ft. thick, with clay beneath and shales above, the collier, lying on his side, cuts with his pick a narrow, and, perhaps, horizontal, opening beneath the seam. This is an operation which calls into play a good deal of skill and caution, and it requires a few years actual working to acquire that skill. This is carried out by the "holing pick," called also a mandrell or maundrell, or, in some places, a pike or slitter. It is double-headed, and has an extra length of handle, and, lying on his side, the "holer" will use it with great effect, and often cut in horizontally for 3 ft., or even more. It is in this work that the greatest sacrifice of life in the mines is incurred. The men who ought to prop up the superincumbent mass defer doing so as long as they can, in order to save their time, and large fragments are apt to break away suddenly, and crush whoever may be so unfortunate as to be beneath. A very slight prop would be sufficient in most cases to prevent this, and in 99 cases out of 100 the accident is due to carelessness. The handles of these picks are from 27 to 30 in., and in South Wales 34 in. long. The "holing" being completed, the miner next proceeds to shear the coal—that is, to cut it down vertically, the cut being a few inches wide, and heavier picks are employed for this purpose in many districts, particularly in the collieries of the Newcastle district and in the North of England. Some of the most curious picks, probably, are those of the Box Tunnel stone quarries. The stone is soft enough to allow it to be holed very much as if it were coal, but, as it has to be got in vast blocks, the holing is carried to a much greater depth, to allow of the introduction of the saw, and the handles of the picks are from 5 ft. to 6 ft. long, with very light heads. The men, in working with these implements, adopt a rather peculiar system. When they have delivered the blow they drop their pick, and draw it towards them. In their hands, however, it is very effective. The French and Westphalian picks differ considerably from all those I have referred to; but, as a general rule, they are of the two-pointed type. Our Cornish miners drive into the interstices of the rock, and then use their picks like levers. They break away considerable masses, and, being strong-armed men, do wonders in this way; but in the mines of Saxony and the Hartz there is no ground at all fissured or scaly, and the work there has consequently to be done by employing hammers (German, Schlägel) and wedges (eisen). The Saxon miner in descending to his work takes with him a whole series of wedges, of different sizes. The wedge, or as it is termed the "gad," is also used in Cornwall when the nature of the rock requires it. These two methods are those principally used even now, although the introduction of gunpowder has given great facilities in dealing with masses of rock on a large scale. Another variety of pick is employed in the extreme west of Cornwall, where the lodes are extremely small, and somewhat hard, so that they would puzzle miners accustomed to lodes of larger sizes. The lodes being only 3 or 4 in. wide, it is necessary to take out as little ground as possible, and thus the miner, who is, however, obliged to carry a portion of the ground before him with the lode, uses what is called a packer or poker, which is nothing else but a long wedge. These are common in the neighbourhood of St. Ives and St. Just, and in the peninsula of Land's End, where sometimes they have to work under water, and where the water is very quick.

In getting coal it is often necessary to put in a whole line of wedges to break it off up to the point to which it has been holed. The natural stratification may or may not, according as the colliery is laid out, have a tendency to bring down the mass so quickly that the men can hardly work without danger of its falling upon them. In the larger number of cases, however, it is necessary to employ some process to bring it down. For this purpose a series of wedges is placed on the top of the coal, between it and the roof, a series of wedges is placed ... Blows are then given in succession along the line, and the whole is broken off to the farthest point of the holing, and falls down. Some coals are so hard and so attached to the roof that bore-holes are made, and powder lodged in them, to blow them down. This is a practice productive of a great number of accidents. It is now a desideratum to find out a mechanical agent more powerful than wedges to supersede gunpowder. The evils of gunpowder are—First, that the blast itself is liable to ignite fire-damp; secondly, that in the actual removal of the masses it may free fire-damp, and let it into workings which did not before contain any, and thus lead to danger; and, thirdly, that carrying a naked light to fire a fuse is a most dangerous system. It is, therefore, most desirable that something else should take its place, and many experiments have been made. Amongst others, compound wedges have been tried, and screws to force down the coal, but nothing as yet has been found so effective as gunpowder. It has often been said that, with proper care and attention, it is not dangerous; but it is impossible to get rid of the entire risk. In quarries the men use what is called "plug and feather." A series of holes is drilled, as if they were about to fire a charge of powder, and then wedges put in. But ordinary wedges in extremely hard rocks would only split off the angles, so they put in on each side of the hole a strong piece of iron, leaving only just room enough to admit the feather edge of a large wedge, and the result is that great masses of rock are detached. Another plan in particular kinds of rock is to bore a series of holes, and put into them pieces of dry wood, which, when water is poured in, swell, and rive off large masses of stone. In the Finland granite quarries the same result is produced by the action of frost; the holes being filled with water, the crystallisation is powerful enough to force large pieces of granite from their beds. In ancient times, however, the hammer and wedge furnished miners with almost the only method by which the rocks were worked through; and if we compare the older work with that which is more modern, we shall find that they did their work with singular efficiency and smoothness.

ON MINING, AND UNDERGROUND GASES.

A meeting of the members of the South Midland Institute of Mining, Civil, and Mechanical Engineers was held in the School of Art, Wolverhampton, on Monday, when Mr. J. P. BAKER, her Majesty's Inspector of Mines for South Staffordshire, delivered the first of a series of lectures on "Mining, and Underground Gases." There was a numerous attendance, including, in addition to members of the institute, several chartermasters, colliery butties, and others, both men and boys employed in various pits in the district, who had been invited to attend. Mr. HENRY BECKETT (President of the Institute) occupied the chair, and amongst those present were Mr. T. Walker, solicitor; Mr. J. W. Hall, Bilston; Mr. Jones, mining engineer of the Lilleshall Company; Mr. Bowkley; Mr. S. Rose; and Mr. James Cope, the hon. secretary.

The PRESIDENT, in opening the proceedings, said they were met to listen to a lecture from his friend, Mr. Baker, on the subject of "Mining and Underground Gases." He was exceedingly glad that Mr. Baker had taken such a subject in hand, because from his long experience as Inspector of Mines in this district he would be able to treat the subject in a thoroughly practical manner, and would be able to tell them all something that would be useful to them in their daily occupations. He (Mr. Beckett) was happy to have Mr. Baker as a member of that institution, for he took a deep interest in all connected with it, and he had made some very good suggestions, especially that of inviting the butties and other persons employed in the underground workings of the mines in the district to attend their meetings when lectures were being delivered, in order that they might profit by the information to be derived therefrom.

Mr. BAKER, who was received with hearty applause, commenced by saying that the present lecture was only a kind of introduction to those which had to follow. His object in delivering the lectures was simply to talk to them plainly on subjects which had something to do with their daily toil, with the view, if possible, to send them away better informed and more fitted to deal with the difficulties and dangers which beset their calling as miners, in the hope that the result might be greater security not only to life and limb, but also to property. (Hear, hear.) The Inspector gave a statistical return of the number of deaths in collieries in the year 1868. Of the total of 1011 in the collieries in England and Wales as many as 104 had died in this district, or one in every 270; for it was computed that the miners in South Staffordshire and East Worcestershire numbered 28,600. He then proceeded to describe the physical properties of certain gases with which the miners had so much to do; and said the one to which he should mostly direct their attention was principally composed of two airs or gases; it was atmospheric air. Mr. Baker then explained at some length the relative proportions of the two gases, oxygen and nitrogen, of which the atmospheric air is composed, its elasticity and expansive power, its weight, specific gravity, and temperature, elucidating his remarks by experiments upon air pressure, and the like. He afterwards discussed the principal features of natural ventilation. As to ventilation, some people, he was sorry to say, considered a mine sufficiently ventilated so long as a lighted candle continued to burn. This was a great mistake, but one, he feared, which was often made, not only by the working colliers, but also by their superiors; and it had been a fruitful source of evil and loss of life in South Staffordshire. He hoped, however, that he had heard the last of such ventilation. If ventilation meant anything at all, it certainly meant a thorough and abundant circulation of air, not only in every working place in the mine, but in so much of the mine as was necessary to the safety of the working places. It was not enough to ventilate the working places; ventilation must be provided and maintained in places contiguous to the working places of the mine. Mr. Baker here read the substance of a legal decision upon this point, given in the Court of Queen's Bench, in November, 1868, upon an appeal by Mr. Brough, the Inspector for the west district. In illustrating the methods of obtaining good ventilation under difficult circumstances, Mr. Baker sketched two diagrams upon a black board, and explained what was the exact scientific condition of the ventilation when the pits were said to be "fighting," or "striving." This striving, he said, sometimes went on until it came to a state of stagnation, which the miners often stated was the result of "no air on the bank." (A laugh.) It would be very sad indeed for those at work in the pits if ever such a state of things should come to pass. What had taken place was that the columns of air in the upcast and downcast shafts being equal, of course natural ventilation ceased to be of any effect. In order to set it again in motion, some kind of artificial means was requisite. He then passed on to describe the difference in the circulation of air in the shafts and mines in winter and summer. This he did in a description of much amplitude, endeavouring to impress in a forcible manner the minds of those men present who are for the most part daily entrusted with the management of the underground operations of the district—pointed out the inadequacy of what are called "surface furnaces," fires in the sides of pit shafts, and lamps hung part way down—all of which artificial appliances produced no really good practical result. Next he pointed attention very forcibly to the system often adopted of contracting the circulation of the air in the passages of the mines, which he condemned, because although they by this means increased the velocity of the air they diminished the expenditure, and virtually deprived themselves of the capabilities of their shaft area. The velocity of air flowing in shafts, Mr. Baker showed, was based on the law of falling bodies. The means of ascertaining it he described, setting forth the velocity at which air rushes into a void.

On the subject of the resistance of the air in mines, the lecturer said that it increased as the square of the velocity, and if an attempt should be made to increase the ventilation without altering the airways the resistance increased as the square of the velocity, and if the velocity were doubled the resistance would be four times as great. The power required to increase ventilation, the air-ways remaining the same, increased as the cube of the velocity, and perhaps a little more. Therefore, air-ways of large sectional area should always be provided. The lecturer stated that a current of air, moving at the rate of ½ ft. a second, or about 30 ft. a minute, sensibly deflected the flame of a candle, which some people often called good ventilation. This, in an air-way 4 ft. square, would equal about 480 cubic feet per minute, or in an air-way 5 ft. by 6 ft., 900 cubic feet per minute; whilst in a downcast shaft of 40 feet sectional area, moving at the rate of 200 ft. per minute, would give 8000 cubic feet, thus showing how much slow speed deprived the mine of the capabilities of the shaft. As the velocity of the downcast shaft was increased, the quantity of air showed how the ventilation might be improved in the air passages in the mine. He then exhibited a water-gauge, an instrument used to show the differences of pressure, or what is technically termed "the drag of the mine," and pointed out the desirability of having large shafts, in addition to which air passages, whether in the shape of gate-roads or independent air-ways, should be of the most ample and uniform dimensions. Otherwise these indispensible conditions could never be satisfactorily established. The lecturer explained the use of the barometer and thermometer, which he said were of the greatest value to the colliery manager, and other persons having the conduct of underground operations. He was not, however, prepared to state that the use of these instruments was calculated to prevent colliery explosions altogether, or that some of the accidents might have been prevented by a true regard to their indications. Probably some might, and others might not. Nevertheless, he would recommend their use at every colliery, as their admonitary indications, if duly observed, could not fail to bring about more thoughtful supervision underground. He did not, however, mean by those observations that the instruments alluded to should supersede, or in the least degree tend to diminish, the underground supervision. On the contrary, he said, "let the condition of the mine itself be the indicator of danger, and on no account should those indications be neglected, particularly as the indications of the barometer are found to be somewhat behind the atmospheric variations." To meet these meteorological changes, provisions should be made in every respect of the most ample character. The lecturer then went on to show the effect on a fall of the mercurial column of ¼ in., and also the 10° increase of temperature concurrent with it. Now, such a barometric and thermometric indication would effect every 1000 cubic feet of confined air and gas in a mine, the combined effect of which was equal to 36 cubic feet, or about 3½ per cent. A few observations on the causes of barometric variations might be useful, and these he elaborately explained; and, in conclusion, said if any chartermaster or his deputy had failed to understand what he had said, and wished further information, if they would only give him sufficient notice he should be happy to visit them and give them the information they needed. (Applause.)

The PRESIDENT, in moving a vote of thanks to Mr. Baker for his lecture, said they would all agree with him that Mr. Baker was thoroughly at home upon the subject he had taken up; and that it was a cause of congratulation that their society had such a man upon their list of members. He was delighted that Mr. Baker intended to continue the subject in three or four more lectures.

The proposition was carried unanimously.

Mr. BAKER, in responding, said he trusted that what he had said would not have been heard in vain. He was satisfied that if this should be so, there would be a great diminution in the loss of life which too often occurred in the mining operations of that district. He had not exhausted the subject, and he hoped that when they met again that which he should have to bring before them would be of more interest than that which they had now heard. The result of the whole, he trusted, would be to make them better men, and more fitted for the situations which some of them held. (Applause.)

Seven new members were added to the list, and the proceedings terminated.

FOREIGN MINES.

ST. JOHN DEL REY.—The directors have received, per La Place, the following report, dated Morro Velho, November 29:—"Morro Velho produce, second division of November, 11 days, 3701 oits.; yield, 2·651 oits. per ton. Gaia produce for above period, 206 oits.; yield, 0·650 oits. per ton." The company's agents at Rio report the arrival of a remittance from the mines amounting to 30,171 oits., which will be sent forward by the English steamer due at Southampton on 15th inst.

DON PEDRO.—Mr. Symons reports, Dec. 1: Produce weighed to date, 7457 oits.; estimate for November, 9000 oits. General operations both in and out of the mine have progressed, though a heavy sick list, 15 per cent. some days, has militated very much against us, and put us at times to great straits. The season has been very unhealthy. The water continues to increase in the mine, and sinking goes on but slowly. From the bottom stopes the supply of ore has been limited, but from "reserves" west of gully we have had a good supply, though poor as yet. The tramroad in Bryant's cross-cut has been laid. Some box work has been taken out from southern extremity of curve. Very little has been done in No. 6, and no alteration to note. We hope to get a horse-engine to work by the end of the month. The man-engine has been remodelled, so that mules can supply the place of men. The 12 hands relieved will push on with the sinking of Vivian's shaft below the footwall of curve, where there are indications of auriferous ground making. The ground continues favourable in Treloar's level, and fair duty is being accomplished. The exploration in Alice's west is going on.

CHONTALES (Gold and Silver).—John Tonkin, November: San Antonio Mine: I beg to hand you my report of the above mine for the past month.—Stoping: The No. 1 stope, in back of the No. 5 level, east of Piper's shaft, has been stoped 28¼ varas; the lode is 3 ft. wide, worth 7 dwts. of gold per ton. The No. 2 stope, in back of the same level, east of Piper's shaft, has been stoped 23¼ varas; the lode is 3½ ft. wide, worth 8 dwts. of gold per ton. During the month we have had to repair the No. 5 level, which prevented us from tramming through this level for the first part of the month. The quantity of quartz sent to the stamps for the past month is 120 tons, which I estimate to be worth 8 dwts. of gold per ton, equal to 48 ozs. of melted gold.

ROSSA GRANDE.—Mr. Hilcke reports: The general appearance of the lode at Mina de Serra is unaltered, still having a very promising looking lode in the end of the 56 fathom level, and that in the stopes opened out below this level is quite equal to expectations. In the 60 fm. level the lode has been intersected; its size so far is small, but the level is hardly far enough driven to intersect the main shoot. The produce for the month he may term as a fair one; it will be hopes exceed 2000 oits. The operations of the explorations at Gongo are proceeding well, but the features at the places of progress are much the same as last commented on.

GENERAL BRAZILIAN.—Capt. Treloar reports, Nov. 30: As before advised, little or nothing is or can be done towards opening the mine this year. We want mine force, but this will not be forthcoming before the crops now in the ground are further advanced. A fair staff of officers, mine captains, and overseers is being organised. The small force we have is occupied mainly about buildings, water-courses, and roads, but progress is retarded by bad weather. We commenced operations late in the year, and the depth of the wet season is now approaching, so there is no remedy but patience. Capt. Treloar advises that judicial possession of the mines was taken on Nov. 19.

CAPULA (Silver).—Capt. Paull, Dec. 7: The net value of the silver (361 marcs) from torta No. 10 amounted to $3223. Torta No. 11 will be washed next week, but I don't think in time to send the silver by the next conducta. We incorporated last week a small torta of 83¼ cargas in Jesus hacienda; that was ground in the mill. The metal of the last torta, reduced in Jesus, and also what has been reduced in San Cayetano, has been ground in stamps. The owner of Jesus thinks he can get better results if ground in the mill.—Mine: The ground in San Pablo cross-cut is still very hard, but from appearances on Saturday we may soon expect an improvement, as it is letting out more water, and the quartz is of a different kind, with spots of ore. In the Esperanza end the ground is still favourable for driving; four men and two boys drove 3 varas 39 centners the last fortnight; the lode is more promising, producing stones of fair quality ore. Last week we set five stopes—three east and two west of San Jorge rise; the price per vara—lowest $12, highest $14; they broke 300 castales, that will produce about 60 cargas of good ley ore. In San Enrique winze the ground is much harder; present price, $40 per vara; sinking by four men and two boys. The lode is still producing azogue ore, with large spots of rich blue ore; the best part appears to be still standing to the south, which we shall take down as soon as we have room in the ore-yard for dressing. The miners are working very regular, and appear to be very well contented.

LUSITANIAN.—Jan. 4: At Taylor's engine-shaft, below the 130, the lode is worth ½ ton of ore per fm. No. 79 winze, below the 120, on Basto's lode, is holed. In the 130, east of Taylor's, on Basto's, the lode is worth 1 ton of ore per fm. In the 130 west the lode is 4 ft. wide, composed of quartz and a branch of ore, worth ½ ton per fathom. In the 120, east of Taylor's, the lode is 1½ ft. wide, composed of quartz and a little mundic. In the 120 west the lode is 2 ft. wide, composed of country and flookan. In the 90, east of River shaft, the lode is 2½ ft. wide, composed of quartz, mixed with country. In the 70 the lode is worth 1¼ ton per fm. In the 28, west of cross-cut, west of Peres' shaft, the lode is unproductive. In the 28, east of cross-cut, west of Peres' shaft, the lode is worth 1 ton of ore per fm. In the 18, west of cross-cut, west of Perez' shaft, the lode is 1 ft. wide, composed of flookan and country. In the 18, east of the cross-cut, west of Perez' shaft, the lode is 8 in. wide, producing stones of ore. In the 10, east of No. 71 winze, the lode is 8 in. wide, yielding stones of ore.—Carvalhal: At the incline shaft, below the 50, the lode is composed of strings, with spots of lead. In the 50, east of incline shaft, the lode is worth 1 ton per fm. In the 40, east of incline, the lode is worth ¾ ton of lead per fm. In the 30 east the lode is 2¼ ft. wide, composed of quartz, with lead, worth ¾ ton per fm. In the 20, east the lode is 1 ft. wide, composed of quartz and stones of mundic. In the 10 east the lode is worth ½ ton per fm. In the adit, west of incline shaft, on the caunter lode, the lode is 1 ft. wide,—country and a little quartz. In the 10 west the lode is 1½ ft. wide, quartz and mundic, with spots of lead. In the 40 west the lode is 6 inches wide, with a regular wall.

NEW WILDBERG.—J. Sanders, Jan. 7: Carter's shaft: The drivage on the Erbtiefstergang Erskammer, in the 70, is worth 1¼ ton of ore per cubic lachter, and the stope above the level is also worth 1¼ ton per cubic lachter. The rise above the 60, towards Johanne's sink, is worth 1 ton, and the stope east of Michael's shaft 1 ton of ore per lachter.—Dornergang Erskammer: There is no change to notice in the stopes above the 50, the average yield being 1 ton of ore per lachter; and the tribute pitch on the Gotteshülfe 1¼ ton per lachter. The drivage east at the Erbstollen is yielding stones of ore, and we hope it may lead to an improvement.—Beek's Workings: There is no change to notice in this part of the mine during the week.—Blumengang: The stope above the 70 remains as last week, worth 2 tons; and the stope above the 60, 1¼ ton of ore per lachter.—West Blumengang: We have opened the sink, and believe it to be standing open to the bottom; the old pumps are in it, and we think we can get out the water with them. We are fixing the pipes in the level, and shall fix the small pumping-engine over the sink as soon as possible.

[For remainder of Foreign Mines see to-day's Journal.]

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